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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/652,580	08/31/2000	Vishnu K. Agarwal	98-0616.15	4283

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EXAMINER

EVERHART, CARIDAD

ART UNIT PAPER NUMBER

2825

DATE MAILED: 05/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/652,580

Applicant(s)

AGARWAL, VISHNU K.

Examiner

Caridad M. Everhart

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 15 April 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 54-56 and 76-92 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 54-56, 76, 78-83, 85, 86 and 88-92 is/are rejected.
- 7) ☒ Claim(s) 77, 84 and 87 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 15.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

Applicant's arguments with respect to claims 54-56 and 76, 78-83, 85, 86, 90-92 have been considered but are moot in view of the new ground(s) of rejection.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Claim Rejections - 35 USC § 103***

Claims 54-56 and 76, 78-83, 85, 86, 88-92<sup>are</sup> rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US 5,552,341) in view of Jung, et al. ("Jung")(US 6,190,837B1).

Lee discloses the steps of forming a conductor on a substrate(col. 9, lines 30-32), treating with a silylation compound such as silane(col. 9, lines 43-46 and claim 1 and col. 14, lines 53-61), and forming a second conductor such as Al(col. 10, lines 1-3). The conductor can also comprise Cu(col. 17, lines 8-11). The silylation treatment prevents diffusion, including the effects of oxygen, as the silylation layer would react with oxygen before the oxygen reached the metal because the silylation layer is hydrogen terminated(col. 10, lines 50-51 and lines 37-43). The first conductor may comprise W or WN(col. 4, lines 20-25). The second conductive layer can comprise WN, since further barrier material is deposited after the silylation layer(col. 10, lines 60-69). The Al layer can then be interpreted as a third conductive layer. This layer may comprise Cu, as pointed out above. The temperature is within the recited range (col. 11, lines 37-41). With respect to the flow rates, these are variables of the art, which one of ordinary skill in the art would be able to determine with experimentation. With respect

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to the choice of inert gas, Lee teaches N<sub>2</sub>(col. 10, lines 15-20), so that it would have been within the ordinary skill in the art to have used another inert gas.

Although Lee is silent with respect to oxygen, it is expected that some oxygen is prevented from diffusing for the reasons given above, for example that the silylation layer will have hydrogen termination and as stated above.

Lee does not teach methylsilane.

Jung is relied upon only for its teaching of trimethyl silane for silylation(col. 3, lines 28-32).

One of ordinary skill in the art would have been motivated to have used the trimethyl silane as taught by Jung rather than the silane as the silylating agent because the addition of the methyl groups would stabilize the radical that would be formed by the reaction, thereby increasing the reactivity. One of ordinary skill in the art would have been motivated to have used methyl silane because trimethyl silane and methyl silane are homologous.

***Allowable Subject Matter***

Claims 77, 84 and 87 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record does not teach the tantalum oxide layer nor the forming a dielectric layer on the first conductive layer.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Caridad M. Everhart whose telephone number is 703-

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308-3455. The examiner can normally be reached on ~~Monday~~ through Fridays 7:30-4:00.

If attempts to reach the examiner ~~by~~ telephone are ~~unsuccessful~~, the examiner's supervisor, Matthew S. Smith can be ~~reached~~ on 703-~~308-1323~~. The fax phone numbers for the organization where ~~this~~ application or proceeding is assigned are 703-872-9318 for regular communications ~~and~~ 703-872-9319 ~~for After~~ Final communications.

Any inquiry of a general nature ~~or relating~~ to the ~~status of~~ this application or proceeding should be directed to the ~~receptionist~~ whose ~~telephone~~ number is 703-308-0956.

  
CARDAD EVERHART  
PRIMARY EXAMINER

C. Everhart  
May 17, 2003